$$x^2y+3xy^3-x=3$$

$f(x)=x^2 \quad g(x)=y$

$f'(x)=2x \quad g'(x)=\frac{dy}{dx}$

$f(x)=3x \quad g(x)=y^3$

$f'(x)=3 \quad g'(x)=3y^2\frac{dy}{dx}$

$$\left(x^2\cdot\frac{dy}{dx}\right)+\left(2x\cdot y\right)+\left(3x\cdot 3y^2\frac{dy}{dx}\right)+3y^3-1=0$$

$$\left(x^2\frac{dy}{dx}+9xy^2\frac{dy}{dx}\right)+\left(2xy+3y^3\right)=1$$

$$\frac{dy}{dx}\left(x^2+9xy^2\right)=1-\left(2xy+3y^3\right)$$

$$\boxed{\frac{dy}{dx}=\frac{1-(2xy+3y^3)}{x^2+9xy^2}}$$

$$xy^3 = (1+\sec y)(1+y^4)$$

$$\frac{xy^3}{1+\sec y} = 1+y^4$$

$$4y^3\frac{dy}{dx} = \frac{\frac{d}{dx}(xy^3)(1+\sec y) - (xy^3)\left(\frac{d}{dx}(1+\sec y)\right)}{(1+\sec y)^2}$$

$$\frac{4y^3\frac{dy}{dx}}{4y^3} = \frac{\left(1\cdot y^3 + x\cdot 3y^2\frac{dy}{dx}\right)(1+\sec y) - (xy^3)\left(\sec y\tan y\frac{dy}{dx}\right)}{4y^3(1+\sec y)^2}$$

$$\frac{dy}{dx} = \frac{y^2\left(y+x\cdot 3\frac{dy}{dx}\right)(1+\sec y) - (xy^3)\left(\sec y\tan y\frac{dy}{dx}\right)}{4y^3(1+\sec y)^2}$$

$$\frac{dy}{dx} = \frac{(y^2)(1+\sec y)\left(y+3x\frac{dy}{dx}\right)}{4(y^3)(1+\sec y)^2} - \frac{x(y^3)\sec y\tan y\frac{dy}{dx}}{4(y^3)(1+\sec y)^2}$$

$$\frac{dy}{dx} = \frac{y+3x\frac{dy}{dx}}{4y(1+\sec y)} - \frac{x\sec y\tan y\frac{dy}{dx}}{4(1+\sec y)^2}$$

$$\frac{dy}{dx} = \frac{(y)}{4(y)(1+\sec y)} + \frac{3x\frac{dy}{dx}}{4y(1+\sec y)} - \frac{x\sec y\tan y\frac{dy}{dx}}{4(1+\sec y)^2}$$

$$\frac{dy}{dx} - \frac{3x}{4y(1+\sec y)}\frac{dy}{dx} + \frac{x\sec y\tan y}{4(1+\sec y)^2}\frac{dy}{dx} = \frac{1}{4(1+\sec y)}$$

$$\frac{dy}{dx}\left(1 - \frac{3x}{4y(1+\sec y)} + \frac{x\sec y\tan y}{4(1+\sec y)^2}\right) = \frac{1}{4(1+\sec y)}$$

Oct 11-7:35 AM

$$xy^3 = (1+\sec y)(1+y^4)$$

$$\left(y^3 + 3xy^2\frac{dy}{dx}\right) = \left(\sec y\tan y\frac{dy}{dx}\right)(1+y^4) + (1+\sec y)\left(4y^3\frac{dy}{dx}\right)$$

$$3xy^2\frac{dy}{dx} - \sec y\tan y(1+y^4)\frac{dy}{dx} - 4y^3(1+\sec y)\frac{dy}{dx} = -y^3$$

$$\frac{dy}{dx}\left(3xy^2 - \sec y\tan y(1+y^4) - 4y^3(1+\sec y)\right) = -y^3$$

$$\frac{dy}{dx} = \frac{-y^3}{3xy^2 - \sec y\tan y(1+y^4) - 4y^3(1+\sec y)}$$

3.6/14 $x^3y^2-5x^2y+x=1$

$$\left[\frac{d}{dx}(x^3)\cdot y^2+x^3\cdot\frac{d}{dx}(y^2)\right]-5\left[\frac{d}{dx}(x^2)\cdot y+x^2\frac{dy}{dx}\right]+1=0$$

$$3x^2y^2+2yx^3\frac{dy}{dx}-5\left(2xy+x^2\frac{dy}{dx}\right)=-1$$

$$2x^3y\frac{dy}{dx}-5x^2\frac{dy}{dx}=-1-3x^2y^2+10xy$$

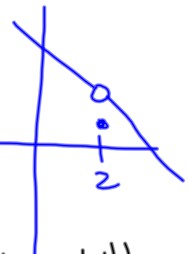
$$\frac{dy}{dx}=\frac{-1-3x^2y^2+10xy}{2x^3y-5x^2}=\frac{-(-1-3x^2y^2+10xy)}{-(2x^3y-5x^2)}$$

$$=\frac{1+3x^2y^2-10xy}{-2x^3y+5x^2}$$

chaptre 2

2.1) Limits intuitively

"everyone" missed $\lim_{x\to2} f(x)$



2.2) Interior limits

$\frac{0}{0}, \frac{\infty}{\infty}$ // $\frac{\text{non } 0}{0} \to +\infty,\ -\infty,\ \text{DNE}$

- relationship to vertical asymp

{ valuable skill
think like an
x getting close
to a # but not
hitting it

2.3) limits to infinity

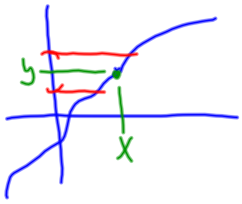
$\frac{0}{0}, \frac{\infty}{\infty}, \infty-\infty$

- relationship to horizontal asymp

= techniques for 2.2 and 2.3

factor / cancel
multiply by conjugate → cancel
create a fraction → cancel
factor out powers of x → $\lim_{x\to-\infty} \frac{\sqrt{x^2-}}{\quad}$ ↓ $\lim_{x\to-\infty} \frac{\sqrt{x^2 \sim}}{x -}$

2.4



$y+\epsilon = f(x+\delta)$

$y-\epsilon = f(x-\delta)$

2.5) continuity: 3 prong def^n

find k that makes ..... continuous

2.6) trig limits

in particular $\lim_{x\to0} \frac{\sin x}{x}$, $\lim_{x\to0} \frac{1-\cos x}{x}$